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CANADA

OPERATIONAL RESEARCH DIVISION

DIRECTORATE OF OPERATIONAL RESEARCH (JOINT & LAND)

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A COLOUR-CODED YEAR 2000 OPERATIONAL READINESS REPORTING SYSTEM

by

Ivan Taylor, JSORT

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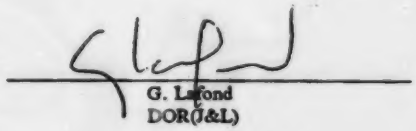
Approved by: 
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ABSTRACT

The Operational Readiness Program in the Y2K Project is determining the state of Canadian Forces systems in terms of potential failures caused by the date change on 1 January 2000. The project has 12 representative missions for the Canadian Forces and is determining the impact of non-compliance on these missions and the optimal combination of repairs, replacements and work-arounds to implement to prepare for year 2000 contingencies. The Operational Research Division was tasked by the Deputy Chief of Defence Staff to develop a reporting system to track the progress of the remediation work and report on the impact of these efforts in terms of mission performance. The author was asked to develop a logical, explainable and consistent roll-up methodology that was based on colour-coding systems, sub-tasks, and tasks. The colour-coding system developed in this paper was proposed as a simpler option to replace a numerical system originally developed for this tasking, reference 5.

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A COLOUR-CODED YEAR 2000 OPERATIONAL READINESS REPORTING SYSTEM

INTRODUCTION

1. The Operational Research Division (ORD) was tasked by the Deputy Chief of Defence Staff (DCDS) to develop a reporting system for the Operational Readiness Program (ORP), which is a part of the Y2K Project, reference 1. The ORP has been organized according to five scenario domains: Search and Rescue, Regional/Bases, National, Continental, and International. For each scenario domain, missions have been identified which could be exercised during 1999 to test compliance of the necessary systems. The tasks to be undertaken in these missions have been drawn from the Canadian Forces Joint Task List. The systems required to execute these tasks have been identified by the Y2K contractors, as well as, potential options for these systems. The Technical Compliance Program (TCP) will identify the systems that are compliant and non-compliant. All non-compliant systems will be assumed to be suspect and require repair, replacement, or work-arounds. The state of systems at present, prior to the implementation of the repairs or replacements, will specify the "As Is" state. The ORP will identify the optimal set of repair, replace and work-around options to be implemented between fall 1998 and fall 1999. The implementation of these options represents the "To Be" state. An operational readiness reporting system could be used to track the impact of the ORP on the scenario domain missions during the implementation process from fall 1998 to Jan 2000.

THE COMPLIANCE CODING SCHEME

2. The ORP decided to adopt a compliance coding system to report the status of the 12 missions that will be considered as representative of the Canadian Forces mandate. This system is based on the Canadian Force Joint Task List (reference 3). The approach required a consistent "roll-up" methodology to express the system data in terms of sub-tasks, tasks, and missions. The ORD was asked by the Director of the ORP to undertake to develop a logical, explainable and

consistent roll-up methodology that was based on colour-coding systems, sub-tasks, and tasks (reference 4).

3. The compliance coding scheme required by the Director of the ORP was:

a. **NEITHER** – the system is not compliant and has no viable, tested workaround;

b. **WORKAROUND** – the system is not compliant but has a viable and tested workaround. However, the workaround will probably result in degraded performance; and

c. **COMPLIANT** – the system has been repaired or replaced and the fix has been tested but may not have been validated or certified.

This coding scheme was adopted for the operational readiness reporting system and expanded to "roll-up" to sub-tasks, tasks, and missions as described below.

THE CRITICALITY INDEX

4. The following criticality index was also developed in the ORP.

a. **0** – the system is not required to accomplish the sub-task;

b. **1** – the system is "nice to have" to accomplish the sub-task;

c. **2** – the system is necessary to accomplish the sub-task; and

d. **3** – the system is essential to accomplish the sub-task.

This criticality index was adopted and expanded to consider subtasks and tasks.

COMBINING THE COMPLIANCE CODE AND CRITICALITY INDEX

5. The compliance code and the criticality index were combined into an overall picture of the systems in the sub-task (as shown in Table I).

TABLE I

COMBINING THE COMPLIANCE CODE AND CRITICALITY INDEX

System Criticality	NEITHER	WORKAROUND	COMPLIANT
0 – Not Required	Acceptable	Acceptable	Acceptable
1 – Nice to Have	Marginal	Acceptable	Acceptable
2 – Necessary	Unacceptable	Acceptable	Acceptable
3 – Essential	Unacceptable	Marginal	Acceptable

This matrix of rules was chosen to describe the systems' impact on sub-tasks, sub-tasks' impact on tasks, and tasks' impact on missions.

THE ROLL-UP METHODOLOGY

6. Since criticality is already considered in the matrix of combinations above, the roll-up methodology is relatively straightforward. Consider a scheme where systems roll up to sub-tasks as an example.

a. A Sub-Task will be **Red** – if any of the compliance/criticality codes for the underlying systems is Unacceptable.

b. A Sub-Task will be **Yellow** – if all of the compliance/criticality codes for the underlying systems are Marginal or Acceptable.

c. A Sub-Task will be **Green** – if all of the compliance/criticality codes for the underlying systems are Acceptable.

Therefore, if any necessary or essential system is NEITHER, the sub-task is Red. If none of the necessary or essential systems are NEITHER but an essential system is WORKAROUND or a nice to have system is NEITHER, then the sub-task is Yellow. If all the essential systems are COMPLIANT, and the necessary and nice to have systems are COMPLIANT or WORKAROUND, the sub-task is Green.

7. The sub-tasks will each have a criticality index for the higher level task. The sub-task colour code computed using the rules above will be combined with the sub-task criticality index to determine the acceptability for the sub-task in the higher task (see Table II).

TABLE II

COMBINING THE COLOUR CODE AND CRITICALITY INDEX

Sub-Task Criticality	Red Sub-Task	Yellow Sub-Task	Green Sub-task
0 – Not Required	Acceptable	Acceptable	Acceptable
1 – Nice to Have	Marginal	Acceptable	Acceptable
2 – Necessary	Unacceptable	Acceptable	Acceptable
3 – Essential	Unacceptable	Marginal	Acceptable

8. The interior of Table II is the same as the interior of Table I. Furthermore, the rules for rolling up the sub-tasks to get colour codes for the tasks are the same as well. Namely,

a. A task is **Red** if any of its sub-tasks are **Unacceptable**;

b. A task is **Yellow** if all its sub-tasks are **Marginal** or **Acceptable**; and

c. A task is **Green** if all its sub-tasks are **Acceptable**.

A similar roll-up can be used to determine the colour of the missions in terms of the colour coding and criticality of the tasks.

THE NEED FOR SUPER-TASKS

9. The colour-coding scheme was reviewed by Operational Readiness Program staff in the Y2K Project and approved in principle on 18 Sep 1998. It was noted that there was a large span of control from the Mission to the Tasks. The need for Super-Tasks was emphasized. These Super-Tasks would group the Tasks into logical categories for Strategic, Operational, Tactical Land, Tactical Air and Tactical Maritime. This would add another level to the hierarchy but would not change the formulation of the roll-up methodology.

THE INPUT DATA FILE

10. To roll-up the systems to the sub-tasks, the sub-tasks to tasks, the tasks to super-tasks, and the super-tasks to missions, a criticality index was needed for the systems, the sub-tasks, the tasks and the super-tasks for all 12 of the missions. The contractors had provided the criticality codes for the systems to the sub-tasks for all 12 missions. Members of the Joint Staff would need to be gathered to develop the matrices for the sub-tasks to the tasks and the tasks to super-tasks and the super-tasks to the missions for the 12 missions. These matrices would not change throughout the reporting period.

11. The values that would be tracked throughout the reporting period would be related to the systems.

a. Planned Months to Develop and Test a Viable Workaround (Planned WORKAROUND);

b. Actual or Revised Planned Months to Develop and Test a Viable Workaround (Actual or Revised WORKAROUND);

c. Planned Months to Repair or Replace and Test System (Planned COMPLIANT); and

d. Actual or Revised Planned Months to Repair or Replace and Test System (Actual or Revised COMPLIANT).

THE OPERATIONAL READINESS REPORT

12. With this data, the Compliance Program can be tracked in terms of operational readiness in the 12 representative missions. For example, for each mission, progress could be displayed from fall 98 in terms of when the mission was **planned** to turn from Red to Yellow and from Yellow to Green. It will also be possible to display when the mission **actually** turned from Red to Yellow and from Yellow to Green. And, if there is a significant deviation from the plan, the revised plan can be displayed.

13. Summary graphs could be produced to show progress over the complete set of 12 missions, or over the super-tasks, tasks, sub-tasks or systems.

14. The text of the report would support the graphs by providing a detailed "drill down" from the missions, into the super-tasks, tasks, sub-tasks, and systems.

CONCLUDING REMARKS

15. A colour-coded operational readiness reporting system was developed for the ORP. The Y2K Project is collecting information on the compliance and criticality of CF systems as they relate to the Joint Task List. However, in order to implement this reporting system it would be necessary to ask the Joint Staff, the Joint Force Headquarters and the Environmental Staffs to provide the information on criticality of the super-tasks, tasks and sub-tasks for each mission. The compliance and criticality information could then be rolled-up into an operational readiness report for the DCDS using the methodology described above. This methodology would be based on military judgement but would be consistent and logical, as well as, explainable and defendable to those outside the Department.

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5. Taylor, Ivan; A Numerical Year 2000 Operational Readiness Reporting System; Directorate of Operational Research (Joint and Land); Research Note RN-9826; December 1998.

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